Electronic Version
Stylesheet Version v1.1.1

Claims

[c1] 1. A shift control apparatus for a bicycle having a plurality of front sprockets and a plurality of rear sprockets, wherein a front derailleur shifts a chain among the plurality of front sprockets and a rear derailleur shifts the chain among the plurality of rear sprockets, wherein the apparatus comprises:
a shift unit that provides signals for shifting the front derailleur and the rear derailleur; and
a prohibiting unit operatively coupled to the shift unit and providing signals so that the chain is prohibited from engaging at least one of i) a laterally innermost front sprocket in combination with a laterally outermost rear sprocket, and ii) a laterally outermost front sprocket in combination with a laterally innermost rear sprocket.

[c2] 2. The apparatus according to claim 1 wherein the prohibiting unit cooperates with the shift unit so that the chain is prohibited from engaging the laterally innermost front sprocket in combination with the laterally outermost rear sprocket.

[c3] 3. The apparatus according to claim 2 wherein the plurality of front sprockets comprise a first front sprocket, a

second front sprocket and a third front sprocket, wherein the first front sprocket comprises the laterally innermost front sprocket, wherein the third front sprocket comprises the laterally outermost front sprocket, wherein the second front sprocket is disposed between the first front sprocket and the third front sprocket, and wherein the prohibiting unit cooperates with the shift unit so that the chain is prohibited from engaging the second front sprocket in combination with the laterally innermost rear sprocket.

[c4] 4. The apparatus according to claim 2 wherein the plurality of front sprockets comprise a first front sprocket, a second front sprocket and a third front sprocket, wherein the first front sprocket comprises the laterally innermost front sprocket, wherein the third front sprocket comprises the laterally outermost front sprocket, wherein the second front sprocket is disposed between the first front sprocket and the third front sprocket, and wherein the prohibiting unit cooperates with the shift unit so that chain is prohibited from engaging the second front sprocket in combination with the laterally outermost rear sprocket.

[c5] 5. The apparatus according to claim 2 wherein the prohibiting unit cooperates with the shift unit so that the chain is prohibited from engaging the laterally innermost

front sprocket in combination with a rear sprocket adjacent to the laterally outermost rear sprocket.

[c6] 6. The apparatus according to claim 5 wherein the plurality of front sprockets comprise a first front sprocket, a second front sprocket and a third front sprocket, wherein the first front sprocket comprises the laterally innermost front sprocket, wherein the third front sprocket comprises the laterally outermost front sprocket, wherein the second front sprocket is disposed between the first front sprocket and the third front sprocket, and wherein the prohibiting unit cooperates with the shift unit so that the chain is prohibited from engaging the second front sprocket in combination with the laterally innermost rear sprocket.

[c7] 7. The apparatus according to claim 5 wherein the plurality of front sprockets comprise a first front sprocket, a second front sprocket and a third front sprocket, wherein the first front sprocket comprises the laterally innermost front sprocket, wherein the third front sprocket comprises the laterally outermost front sprocket, wherein the second front sprocket is disposed between the first front sprocket and the third front sprocket, and wherein the prohibiting unit cooperates with the shift unit so that chain is prohibited from engaging the second front sprocket in combination with

the laterally outermost rear sprocket.

[c8] 8. The apparatus according to claim 1 wherein the prohibiting unit cooperates with the shift unit so that the chain is prohibited from engaging the laterally outermost front sprocket in combination with the laterally innermost rear sprocket.

[c9] 9. The apparatus according to claim 8 wherein the plurality of front sprockets comprise a first front sprocket, a second front sprocket and a third front sprocket, wherein the first front sprocket comprises the laterally innermost front sprocket, wherein the third front sprocket comprises the laterally outermost front sprocket, wherein the second front sprocket is disposed between the first front sprocket and the third front sprocket, and wherein the prohibiting unit cooperates with the shift unit so that the chain is prohibited from engaging the second front sprocket in combination with the laterally innermost rear sprocket.

[c10] 10. The apparatus according to claim 8 wherein the plurality of front sprockets comprise a first front sprocket, a second front sprocket and a third front sprocket, wherein the first front sprocket comprises the laterally innermost front sprocket, wherein the third front sprocket comprises the laterally outermost front

sprocket, wherein the second front sprocket is disposed between the first front sprocket and the third front sprocket, and wherein the prohibiting unit cooperates with the shift unit so that chain is prohibited from engaging the second front sprocket in combination with the laterally outermost rear sprocket.

[c11] 11. The apparatus according to claim 8 wherein the prohibiting unit cooperates with the shift unit so that the shift unit prohibits the chain from engaging the laterally outermost front sprocket in combination with a rear sprocket adjacent to the laterally innermost rear sprocket.

[c12] 12. The apparatus according to claim 11 wherein the plurality of front sprockets comprise a first front sprocket, a second front sprocket and a third front sprocket, wherein the first front sprocket comprises the laterally innermost front sprocket, wherein the third front sprocket comprises the laterally outermost front sprocket, wherein the second front sprocket is disposed between the first front sprocket and the third front sprocket, and wherein the prohibiting unit cooperates with the shift unit so that the chain is prohibited from engaging the second front sprocket in combination with the laterally innermost rear sprocket.

[c13] 13. The apparatus according to claim 11 wherein the plurality of front sprockets comprises a first front sprocket, a second front sprocket and a third front sprocket, wherein the first front sprocket comprises the laterally innermost front sprocket, wherein the third front sprocket comprises the laterally outermost front sprocket, wherein the second front sprocket is disposed between the first front sprocket and the third front sprocket, and wherein the prohibiting unit cooperates with the shift unit so that chain is prohibited from engaging the second front sprocket in combination with the laterally outermost rear sprocket.

[c14] 14. The apparatus according to claim 1 wherein the prohibiting unit cooperates with the shift unit so that the chain is prohibited from engaging i) a laterally innermost front sprocket in combination with a laterally outermost rear sprocket, and ii) a laterally outermost front sprocket in combination with a laterally innermost rear sprocket.

[c15] 15. The apparatus according to claim 14 wherein the plurality of front sprockets comprise a first front sprocket, a second front sprocket and a third front sprocket, wherein the first front sprocket comprises the laterally innermost front sprocket, wherein the third front sprocket comprises the laterally outermost front sprocket, wherein the second front sprocket is disposed

between the first front sprocket and the third front sprocket, and wherein the prohibiting unit cooperates with the shift unit so that the chain is prohibited from engaging the second front sprocket in combination with the laterally innermost rear sprocket.

[c16] 16. The apparatus according to claim 14 wherein the plurality of front sprockets comprise a first front sprocket, a second front sprocket and a third front sprocket, wherein the first front sprocket comprises the laterally innermost front sprocket, wherein the third front sprocket comprises the laterally outermost front sprocket, wherein the second front sprocket is disposed between the first front sprocket and the third front sprocket, and wherein the prohibiting unit cooperates with the shift unit so that chain is prohibited from engaging the second front sprocket in combination with the laterally outermost rear sprocket.

[c17] 17. The apparatus according to claim 14 wherein the plurality of front sprockets comprise a first front sprocket, a second front sprocket and a third front sprocket, wherein the first front sprocket comprises the laterally innermost front sprocket, wherein the third front sprocket comprises the laterally outermost front sprocket, wherein the second front sprocket is disposed between the first front sprocket and the third front

sprocket, and wherein the prohibiting unit cooperates with the shift unit so that the chain is prohibited from engaging i) the second front sprocket in combination with the laterally innermost rear sprocket, and ii) the second front sprocket in combination with the laterally outermost rear sprocket.

[c18] 18. The apparatus according to claim 14 wherein the prohibiting unit cooperates with the shift unit so that the chain is prohibited from engaging i) the laterally innermost front sprocket in combination with a rear sprocket adjacent to the laterally outermost rear sprocket, and ii) the laterally outermost front sprocket in combination with a rear sprocket adjacent to the laterally innermost rear sprocket.

[c19] 19. The apparatus according to claim 18 wherein the plurality of front sprockets comprise a first front sprocket, a second front sprocket and a third front sprocket, wherein the first front sprocket comprises the laterally innermost front sprocket, wherein the third front sprocket comprises the laterally outermost front sprocket, wherein the second front sprocket is disposed between the first front sprocket and the third front sprocket, and wherein the prohibiting unit cooperates with the shift unit so that the chain is prohibited from engaging the second front sprocket in combination with

the laterally innermost rear sprocket.

[c20] 20. The apparatus according to claim 18 wherein the plurality of front sprockets comprise a first front sprocket, a second front sprocket and a third front sprocket, wherein the first front sprocket comprises the laterally innermost front sprocket, wherein the third front sprocket comprises the laterally outermost front sprocket, wherein the second front sprocket is disposed between the first front sprocket and the third front sprocket, and wherein the prohibiting unit cooperates with the shift unit so that chain is prohibited from engaging the second front sprocket in combination with the laterally outermost rear sprocket.

[c21] 21. The apparatus according to claim 20 wherein the plurality of front sprockets comprise a first front sprocket, a second front sprocket and a third front sprocket, wherein the first front sprocket comprises the laterally innermost front sprocket, wherein the third front sprocket comprises the laterally outermost front sprocket, wherein the second front sprocket is disposed between the first front sprocket and the third front sprocket, and wherein the prohibiting unit cooperates with the shift unit so that the chain is prohibited from engaging i) the second front sprocket in combination with the laterally innermost rear sprocket, and ii) the

second front sprocket in combination with the laterally outermost rear sprocket.

[c22] 22. The apparatus according to claim 1 further comprising riding condition sensing means for sensing a riding condition of the bicycle, wherein the shift unit cooperates with the riding condition sensing means to automatically operate the front derailleur and the rear derailleur in accordance with the riding condition.

[c23] 23. The apparatus according to claim 1 further comprising a manually operated shift control device that provides shift command signals to the shift unit, wherein the shift unit operates the front derailleur and the rear derailleur in response to the shift command signals.

[c24] 24. The apparatus according to claim 1 wherein, when the shift unit would, absent influence from the prohibiting unit, attempt to engage the chain with at least one of i) a laterally innermost front sprocket in combination with a laterally outermost rear sprocket and ii) a laterally outermost front sprocket in combination with a laterally innermost rear sprocket, the shift unit engages the chain with a different front sprocket than the attempted front sprocket.